

WHAT IS CLAIMED IS:

1. A method of leaching zinc from a zinc concentrate by grinding the zinc concentrate in an aqueous solution containing free sulfuric acid and ferric ions.
2. The method according to claim 1, wherein said grinding is effected at atmospheric pressure.
3. The method according to claim 1, wherein any by-product that forms on the surfaces of the particles of said zinc concentrate as the result of said leaching is stripped by said grinding in order to shorten the time of said leaching.
4. The method according to any one of claims 1 - 3, wherein oxygen is supplied into the post-leach solution containing the ferrous ions that result from the reduction of said ferric ions during said leaching, whereby said ferrous ions are oxidized to ferric ions and the solution containing said ferric ions is returned to said grinding step.
5. The method according to any one of claims 1 - 3, wherein oxygen is supplied into a pipe through which said aqueous solution is transferred to said grinding step, whereby the interior of said pipe is pressurized.
6. The method according to claim 4, wherein oxygen is supplied into a pipe through which said post-leach solution is returned to said grinding step, whereby the interior of said pipe is pressurized.

208210 8E435001

7. The method according to any one of claims 1 - 3, wherein the concentration of free sulfuric acid that is present in said aqueous solution at the end of the leaching is controlled to be no less than 40 g/L, thereby preventing the formation of jarosite.

8. The method according to any of claims 1 - 3, wherein the concentration of ferric ions in said aqueous solution is controlled to lie within the range of 5 - 60 g/L.

9. The method according to any one of claims 1 - 3, wherein the residue remaining after said leaching in which at least one metal element in said zinc concentrate that is selected from the group consisting of lead, gold and silver is concentrated is subjected to flotation to recover said at least one metal element.

10. The method according to claim 9, in which the float obtained by said flotation is heated to a temperature not lower than the melting point of sulfur, whereby the elemental sulfur in said float is evaporated and recovered.

11. A method of leaching zinc concentrates which comprises the pressurized oxidation step of oxidizing a solution containing free sulfuric acid and iron ions in a pressurized oxidizing atmosphere to prepare an iron-containing, acidic solution and the grinding and leaching step of leaching zinc from a zinc concentrate as the latter is ground in said iron-containing, acidic solution.

12. A method of leaching zinc concentrates which comprises the pressurized oxidation and leaching step of oxidizing a solution containing free sulfuric acid and iron ions in a pressurized

oxidizing atmosphere to prepare an iron-containing, acidic solution which is used to leach zinc from a zinc concentrate and the grinding and leaching step of leaching zinc from the resulting slurry as the latter is ground.

13. A method of leaching zinc concentrates which comprises the pressurized oxidation step of oxidizing a solution containing free sulfuric acid and iron ions in a pressurized oxidizing atmosphere to prepare an iron-containing, acidic solution, the leaching step of leaching zinc from a zinc concentrate by means of said iron-containing, acidic solution, and the grinding and leaching step of leaching zinc from the resulting slurry as the latter is ground.

14. The method according to claim 11 or 13, which further includes an additional grinding and leaching step in which zinc is leached from the slurry resulting from the first grinding and leaching step as the latter is ground in said iron-containing, acidic solution.

15. The method according to claim 12, which further includes an additional pressurized oxidation and leaching step in which the slurry from the first grinding and leaching step in the pressurized oxidizing atmosphere is oxidized to regenerate an iron-containing, acidic solution which is used to leach zinc from said slurry.

16. The method according to claim 15, which further includes an additional grinding and leaching step in which zinc is leached from the slurry resulting from said additional pressurized oxidation and leaching step as the latter is ground.

17. The method according to claim 11 or 13, wherein said pressurized oxidation is performed at a solution's temperature of 90 °C or higher.

18. The method according to claim 12, 15 or 16, wherein said pressurized oxidation and leaching step and said additional pressurized oxidation and leaching step are performed at a solution's temperature of 90 - 120 °C.

19. The method according to any one of claims 11 - 13, wherein the concentration of free sulfuric acid present in the slurry at the end of said leaching is 2 g/L or more.

20. The method according to any one of claims 11 - 13, wherein the concentration of ferric ions in said iron-containing, acidic solution is 2 g/L or more.

21. An apparatus for leaching zinc concentrates which comprises a pressure vessel to be charged with a solution containing at least free sulfuric acid and iron ions, oxygen gas supply pipes that extend into said vessel from the outside and which have oxygen gas inlet ports open below stirrers, and a pipe through which an iron-containing, acidic solution or a slurry that results from the reaction of said solution containing at least free sulfuric acid and iron ions is discharged to the outside has a drain port open in the lower part of said vessel.